BEFORE THE

Federal Communications Commission

WASHINGTON, D.C.

In the Matter of	)	
Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, as Amended by the Broadband Data Improvement Act	)	GN Docket No. 09-137
A National Broadband Plan for Our Future	)	GN Docket No. 09-51
International Comparison and Survey Requirements in the Broadband Data Improvement Act	)	GN Docket No. 09-47

COMMENTS OF COMCAST CORPORATION – NBP PUBLIC NOTICE #1

Comcast Corporation ("Comcast") hereby responds to the recently released Public Notice (*Notice*) in the above-captioned dockets, seeking comment on the definition of "broadband."[1] Specifically, the *Notice* solicits "tailored comment on defining 'broadband' for purposes of the Commission's development of a National Broadband Plan," drawing particular attention to three aspects of this definitional issue: "(1) the general form, characteristics, and performance indicators that should be included in the definition; (2) the thresholds that should be assigned to

[1] Public Notice, *Comment Sought on Defining "Broadband,"* NBP Public Notice #1, DA 09-1842 (Aug. 20, 2009) (*Notice*).

these indicators today; and (3) how the definition should be reevaluated over time."[2] The *Notice* raises some interesting and important questions about various factors that play a role in the broadband Internet consumer experience, and that warrant discussion in the National Broadband Plan. However, for the purpose of defining "broadband," there are two good rules of thumb: first, "simpler is better," and second, "facts are better than speculation." Fortunately, the work already done by the Commission provides a solid foundation for moving forward in a direction that is consistent with these two rules.

I. FOR NOW, THE COMMISSION'S DEFINITION OF BROADBAND SHOULD FOCUS ON BROADBAND INTERNET SERVICE PROVIDERS' PROVISIONED SPEEDS.

Historically, definitions of "broadband" have tended to focus on speed or throughput, primarily because that was one of the predominant features that separated broadband Internet from dial-up Internet.[3] The Commission's initial definitions of broadband also focused on speed,[4] and when the Commission revised its baseline threshold and broadband tiers last year, it continued to focus on speed.[5] Most international organizations, such as the Organisation for Economic Cooperation and Development ("OECD"), also focus on speed in their definitions of

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2 *Id.* at 2.

3 Another important feature of broadband is that, unlike dial-up, it is "always on." That is to say, unlike with dial-up, with broadband Internet there is no need to log on or take other steps beyond merely opening your browser once your computer is connected to the broadband modem.

4 *See, e.g.*, *In re Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps To Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996*, First Report, 14 FCC Rcd. 2398 ¶ 20 (1999) ("[W]e define "broadband" as having the capability of supporting . . . a speed . . . in excess of 200 kilobits per second (kbps) in the last mile.").

5 *In re Development of Nationwide Broadband Data To Evaluate Reasonable and Timely Deployment of Advanced Services to All Americans, Improvement of Wireless Broadband Subscribership Data, and Development of Data on Interconnected Voice over Internet Protocol (VoIP) Subscribership*, Report & Order & FNPRM, 23 FCC Rcd. 9691 ¶ 20 (2008) ("*Broadband Data Order*").

broadband – definitions that largely coincide with the Commission's recently revised baseline threshold.[6]

The *Notice* recognizes that most proposals for defining broadband Internet service "center on download and upload throughput," but it expresses a concern that "neither is precise or diverse enough to describe broadband satisfactorily."[7] This concern is not misplaced. It is a fact that an end user's broadband Internet experience is not solely a function of the speed and throughput of his or her broadband Internet service.[8] Speed and throughput, as well as various other attributes, such as latency, jitter, and reliability, are all relevant to the performance of broadband Internet services. The Commission has recognized that the actual online experience of any particular consumer at any particular moment in time involves a wide range of factors, many of which are outside the control of the Internet service provider.[9] Recognizing that there is no effective way to control for all of these factors in every instance, the "provisioned" speed is still the most useful metric in evaluating whether any particular Internet service is "broadband."

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6 *See* Org. for Econ. Coop. & Dev., *OECD Broadband Subscriber Criteria*, http://www.oecd.org/document/46/0,3343,en_2649_34225_39575598_1_1_1_1,00.html (last visited Aug. 31, 2009).

7 *Notice* at 2.

8 *See* Comments of Comcast Corp., GN Docket No. 09-51, at 13-14 (June 8, 2009) ("Comcast Comments").

9 *See In re a National Broadband Plan for Our Future*, Notice of Inquiry, GN Docket No. 09-51, FCC 09-31 ¶ 20 (Apr. 8, 2009) (noting that "frequency bandwidth, the number of simultaneous users, and distance to the end user affect the data rates delivered" as well as "transmitter power, frequency re-use, and the distance between the end user and the base station" for wireless broadband Internet service). For example, factors such as latency and jitter, the processing power of computers and other devices at either end of the communication, as well as the number of users and applications vying for that processing power (including available processing and network capacity), will directly affect the user's experience. In addition, shared capacity is inherent in *all* networks at some point. *See* Comments of AT&T, Inc., WC Docket No. 07-52, at 6-7 (Feb. 13, 2008); Comments of CTIA - The Wireless Ass'n, WC Docket No. 07-52, at 6 (Feb. 13, 2008); Comments of Verizon & Verizon Wireless, WC Docket No. 07-52, at 32-33 (Feb. 13, 2008).

The "provisioned" speed is the speed that a customer's modem is configured (and the last-mile network is engineered) to deliver on a regular basis.[10] There are a number of variables outside of that portion of the network under the last-mile network engineers' control that must be taken into account in designing networks and determining the speeds a broadband Internet service can deliver. Our engineers provision bandwidth and resources in a manner designed to offset some of those variables in order to deliver the "provisioned," or marketed, Internet speeds on a regular basis.[11] With regard to "actual" speeds, there are a number of reasonably reliable speed tests now readily available to consumers;[12] it is easy for consumers to get a reasonably accurate picture of their own upload and download speeds, and it is equally easy for them to share this information with one another online. However, while these data can be useful for consumers, because of all the factors that play a role in consumers' actual experiences such a metric does not provide the kind of reliable measuring stick that suits the Commission's current goals.

There is at least one other interesting metric of broadband performance, the Broadband Quality Score (BQS) developed and presented by Cisco working with Oxford University,[13] that

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[10] In addition, Comcast has invented a technology called PowerBoost™ that enables consumers to experience brief boosts above their "provisioned" speeds while they transfer large files over the Internet by utilizing excess capacity available in the network. *See* Comcast Corp., *Customers - FAQs: PowerBoost*, http://www.comcast.com/customers/faq/FaqCategory.ashx?CatId=377&INTCMP=ILC-SRCPROMOCOM0078&fss=powerboost (last visited Aug. 31, 2009).

[11] Recent speed tests in the United Kingdom affirm that any actual user's experience may vary from the provisioned speed, but they also indicate that there is no consistent way to demonstrate the variation. *See* Office of Communications, United Kingdom, *UK Broadband Speeds 2009: Consumers' Experience of Fixed-Line Broadband Performance* (July 2009), *available at* http://www.ofcom.org.uk/research/telecoms/reports/broadband_speeds/broadband_speeds/broadbandspeeds.pdf.

[12] *See, e.g.*, http://www.speedtest.net. Comcast also is transitioning from beta use to production use a speed test application available at http://speedtest.comcast.net/.

[13] *See, e.g.*, Robert Pepper, *Presentation at the FCC Broadband Workshops: International Lessons* (Aug. 18, 2009), http://www.broadband.gov/docs/ws_int_lessons/ws_int_lessons_pepper.pdf.

we believe merits thorough review and consideration. The BQS adds another measurable characteristic of broadband performance, latency, and attempts to weigh that factor along with upload and download speeds in ways that also permit more meaningful international comparisons and that peg broadband performance to standard applications that are now in the marketplace or that are reasonably foreseeable over the next five years.

We suggest that the Commission work with and through members of the Internet community to continue exploring whether the BQS or another fact-based model of broadband performance would be useful for the longer term. However, for the Commission's current purposes – i.e., to decide what level of connectivity should qualify as broadband and determine how many households have access to broadband Internet service – the "provisioned" speed is the characteristic to which the Commission should apply its measuring stick.

In addition, using "provisioned" speed will allow the Commission to leverage existing data collection capabilities, across time and across agencies, without incurring substantial new administrative burdens. The Commission's existing broadband Internet service data collection efforts, through the recently revised Form 477, focus on provisioned speed.[14] Maintaining that focus, even while allowing for the introduction of other factors, would allow the Commission to measure progress in broadband deployment and adoption over time. This consistency would permit the Commission to make meaningful longitudinal comparisons and to assess whether we are making progress. Moreover, adopting a metric that is consistent with the metric used in the

[14] In March 2008, the FCC adopted eight new broadband reporting tiers for new Form 477, starting at "greater than 200 kbps but less than 768 kbps" and going up to "equal to or greater than 100 mbps." *Broadband Data Order* ¶ 20.

Broadband Technology Opportunities Program and Broadband Initiatives Program[15] – even if it is not the exact same number adopted as the baseline in those programs – allows for the unification of measurement standards across the three principal federal agencies. A common standard would further promote the efficient review of the effectiveness of those programs and other efforts that are being undertaken to drive deployment of broadband to unserved communities and adoption of broadband by underserved populations.

The other benefit of remaining focused on provisioned speed is that it is technology neutral, and recognizes that there are broadband technologies that provide a kind of "broadband" that is useful for certain types of Internet applications and services, and may in fact be more useful in some cases than in others. For example, the *Notice* asks how "mobility" should be taken into account in any definition of broadband.[16] Mobility is certainly an important aspect of many Internet applications, such as location-based services, but is largely irrelevant to the proper functioning of other applications. Likewise, satellite-delivered broadband obviously has latency issues given the delays inherent in transmitting signals to and from geosynchronous satellites, but the connectivity and speeds offered by these services are often sufficient for many of the applications that consumers use today and will use in the near future.[17]

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[15] *See* Department of Agriculture, Rural Utilities Service, Broadband Initiatives Program, RIN: 0572-ZA01; Department of Commerce, National Telecommunications and Information Administration, Broadband Technology Opportunities Program, RIN: 0660-ZA28, Notice of Funds Availability, 74 Fed. Reg. 33104, 33129-30 (July 9, 2009) ("*BTOP/BIP NOFA*").

[16] *See Notice* at 2-3.

[17] Nevertheless, it was reasonable for NTIA and RUS to decide that "an area that has only high-latency satellite service will still qualify as 'unserved.'" *See BTOP/BIP NOFA* at 33130.

II. THE COMMISSION SHOULD ESTABLISH A PROCESS TO ACCOUNT FOR EVOLVING LEVELS OF BROADBAND INTERNET SERVICE.

The *Notice* asks what "minimum thresholds should be applied" to the performance metric, and whether the Commission should adopt multiple, escalating tiers.[18] As the *Notice* seems to recognize, in thinking about what specific thresholds need to be applied, it is important that it take into consideration the kinds of applications and services that consumers use. Comcast and other cable operators have at every stage worked to anticipate what consumers will demand, and the industry is now moving to the next generation of broadband Internet services.[19]

The Commission could reasonably begin by reiterating its support for the broadband baseline threshold and tiers adopted in the recent Form 477 revisions.[20] These revisions provide the Commission with a granular picture of the state of broadband deployment and adoption at different speed levels. In terms of evolving levels of broadband service, we suggested to the Commission in our earlier comments in this proceeding the following approach:[21]

- Basic Broadband Internet Service – This would be the absolute minimum threshold for qualifying as broadband service. To qualify, the service would have provisioned speeds of at least 256 Kbps downstream and upstream. This is faster than what the Commission has called "first generation" broadband "that at 200 Kbps, consumers can enjoy the most common applications, including web browsing and email, without the delay experienced by dial-up subscribers."[22] This also would be faster than the Commission's current definition, and consistent with the OECD's current definition, of what constitutes broadband Internet

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[18] *Notice* at 3.

[19] *See, e.g.*, Press Release, Comcast Corp., *Comcast Rolls Out Extreme 50 Mbps High-Speed Internet Service in Washington, D.C. and Metro Area* (June 9, 2009), *available at* http://www.comcast.com/About/PressRelease/PressReleaseDetail.ashx?PRID=876.

[20] *Broadband Data Order* at 20.

[21] For a graphical representation of this proposal, and further discussion of why these tiers would be appropriate, please see Comcast Comments at 11.

[22] *In re Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps To Accelerate Such Deployment Pursuant to Section 706 of the Telecomm. Act of 1996*, Fifth Report, 23 FCC Rcd. 9615 ¶¶ 3, 5 (2008).

service.[23] These speeds would be satisfactory for only basic services, but would be a significant increase over dial-up speeds and would provide the "always on" connectivity that is an important aspect of broadband Internet service.

- Current Generation Broadband Internet Service – To qualify, a service would have to deliver provisioned speeds of at least 600 Kbps downstream and 500 Kbps upstream. In Comcast's experience, we find that the speeds delivered by our versions of *Current Generation* Broadband Internet Service, which are higher than the minimum speeds for such service as proposed, allow the vast majority of consumers to access most of the content, applications, and services available on the Internet today; independent research substantiates that view.[24] Current Generation Broadband Internet Services would allow consumers to access the vast majority of applications, services, and content available today on the Internet.[25]

- Next Generation Broadband Internet Service – Comcast proposes three "Next Generation" tiers: *Next Generation* (provisioned speeds of at least 12 Mbps downstream and 2 Mbps upstream); *Next Generation Advanced* (provisioned speeds of at least 50 Mbps downstream and 10 Mbps upstream); and *Next Generation Commercial* (provisioned speeds of at least 100 Mbps service). Speeds provided by "Next Generation" services enhance consumers' ability to access today's content, applications, and services (and in some cases improve the quality of applications and services) while at the same time enabling consumers to access richer content and innovative applications and services as they develop. These definitions also ensure that customers who may need greater speed for specialized uses – for example, small businesses, doctors' offices, and home offices – will have options that meet their needs.[26] Interestingly, our proposed Next Generation definition is largely consistent with what Cisco and Oxford project (based on their survey of expert opinion) will meet the needs of standard applications five years hence.[27]

III. THE COMMISSION SHOULD CONDUCT A BIENNIAL REVIEW OF ITS DEFINITION OF "BROADBAND."

Finally, the *Notice* recognizes that broadband Internet services "have been characterized by rapid evolution and change" and seeks comment on how to ensure that the definition adopted

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[23] *See OECD Broadband Subscriber Criteria*, *supra* note 6.

[24] *Cf.* CBG Communications, Inc., *Final Report: High-Speed Internet Deployment and Adoption Strategy Recommendations for the State of Washington* 7-8 (Dec. 1, 2008) ("*Washington State Broadband Report*"), *available at* http://www.dis.wa.gov/hiswg/docs/HSISWG%20-%20Final%20Report%20-%201Dec08.pdf.

[25] *See* Cal. Broadband Task Force, *The State of Connectivity: Building Innovation Through Broadband* 12 (Jan. 2008) ("*California Broadband Report*") (noting that such speeds would be sufficient for applications such as Voice over IP, Basic E-mail, and Web browsing), *available at* http://www.calink.ca.gov/pdf/CBTF_FINAL_Report.pdf.

[26] *See id.*; *Washington State Broadband Report* at 7-8.

[27] *Cf.* Pepper, *supra* note 13, at 17.

by the Commission today keeps pace with advances in technology.[28] Generally speaking, to account for the dynamic nature of this marketplace, Comcast believes that the Commission should take a fresh look at these definitions every two years – a timeframe coincident with the pace of advances predicted by Moore's Law[29] – to examine whether the benchmarks should be changed.

In so doing, it would not be enough for the agency to look only at how broadband networks are improving. It would be equally important for the agency to review whether applications are continuing to improve and become more efficient. Just as network operators will continue to invest to deliver more bandwidth and better services to end users, there must also be a continuing effort on the part of applications providers to be more bandwidth-efficient.[30] Responsible developers recognize this and make continuing efforts to do so, and the benefits to consumers are readily apparent.

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[28] *Notice* at 3. The *Notice* is consistent with the approach adopted by a number of different states. They generally agree that the definition of broadband Internet service should be revised from time to time: "the definition of broadband should be routinely reviewed and updated according to the current demand and application usage." Dept. of Res. & Econ. Dev. & Telecomm. Advisory Bd., State of N.H., *State of New Hampshire Broadband Action Plan* 10 (June 30, 2008) *available at* http://www.nheconomy.com/uploads/Final-Report-082808.pdf; *see also* Comm'rs Robert M. Clayton III & Steve Gaw, Mo. PSC, *Commissioners' Report on Missouri Broadband Availability* 10 (Sept. 18, 2007) ("The FCC should reevaluate its minimum transmission speeds in light of increasing requirements of new technologies and applications."); *California Broadband Report* at 75 ("As education-related applications require increasing amounts of bandwidth, the state should raise [the minimum] speed periodically to reflect the evolving needs of educational institutions.").

[29] Moore's Law, named after Intel co-founder Gordon Moore, "states that transistor density on integrated circuits doubles about every two years." Intel Corp., *Moore's Law: Raising the Bar* 1 (Feb. 2003), *available at* http://download.intel.com/museum/Moores_Law/Printed_Materials/Moores_Law_Backgrounder.pdf; *see* Kevin Werbach, Office of Plans & Policy, FCC, *Digital Tornado: The Internet and Telecommunications Policy* 6 (Mar. 1997), *available at* http://www.fcc.gov/Bureaus/OPP/working_papers/oppwp29.pdf.

[30] In this regard, Comcast agrees with Colin Buechler of LifeSize Communications, who noted during the August 26th Staff Workshop entitled "Smart Grid, Broadband and Climate Change" that as much as network operators have a responsibility to continue investing to increase bandwidth, application developers need to continue improving their products to make them more bandwidth efficient. *See* FCC Staff Workshop, *Smart Grid, Broadband and Climate Change*, Recorded Webcast at 2:42:50 (August 26, 2009), *available at* http://www.fcc.gov/realaudio/mt082509b.ram.

IV. CONCLUSION

Comcast supports the Commission's efforts to take a detailed and holistic review of what constitutes "broadband Internet service" and how best to measure it. For the near term, and for the purposes of the National Broadband Plan, "provisioned" speed remains the best tool for measuring whether a service qualifies as a "broadband Internet service." The Commission need not squander much time between now and next February in search of the perfect metric, as this is something that can be revisited more thoroughly once the Plan has been delivered.

Respectfully submitted,

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